

# **Commentary: The Course, Curriculum, and Laboratory Improvement (CCLI) Program: What's New About the Current Solicitation and Suggestions for the Geosciences' Community**

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The Course, Curriculum, and Laboratory Improvement (CCLI) program recently released the program guidelines (NSF 09-529) for the next round of the program. There are several changes to the CCLI program and a new program opportunity that invites proposals for projects that would provide leadership and contribute to transforming undergraduate STEM education. This article provides some basic background about the program, points out changes in the new solicitation, and encourages geoscience faculty to submit proposals to this program.

## **BACKGROUND**

The CCLI program at the National Science Foundation (NSF) makes grants for projects that improve undergraduate education in the sciences, engineering, mathematics, and technology at all types of institutions. The CCLI program has its 'roots' in several merged DUE programs (Instrumentation and Laboratory Improvement (ILI), Course and Curriculum Development (CCD), and the Undergraduate Faculty Enhancement (UFE)). It would not be surprising for early career faculty who ask senior colleagues about the ILI program to receive in response a smile and a tour of a laboratory or instrument made possible by ILI. The current CCLI program has evolved from earlier versions that included Adaptation and Implementation (A&I), Educational Material Development (EMD) proof-of-concept and full development, and National Dissemination (ND). More recently, CCLI introduced the 'cycle of innovation', phases (1, 2, and 3), and combined with the Assessment of Student Achievement (ASA) program. Suffice to say, CCLI has had a long history and remains one of DUE's most flexible programs that has and continues to support a wide range of activities aimed at improving the quality of science, technology, engineering, and mathematics (STEM) undergraduate education for all students. Additional information about the CCLI program and examples of how this program can support student research activities can be found in the CUR Quarterly (McBride and Singer, 2002).

## **CCLI has a wide scope**

The CCLI program supports efforts that:

- Bring advances in STEM disciplinary knowledge into the curriculum
- Create or adapt learning materials and teaching strategies
- Develop faculty expertise
- Promote widespread implementation of educational innovations
- Prepare future K-12 teachers

- Enhance our understanding of how students learn STEM topics
- Enhance our understanding how faculty adopt instructional approaches
- Build capacity for assessment and evaluation

The program especially encourages projects that will have the potential to transform undergraduate STEM education, produce widespread adoption of classroom practices based on how students learn, and explore cyberlearning. The most recent program solicitation (NSF 09-529) also invites proposals for Central Resource Projects that provide leadership and implementation of activities that sustain a community of practice engaged in transforming undergraduate STEM education. CCLI Central Resource projects would support activities intended to increase the communications among the STEM education community and increase the impact of CCLI projects. Central Resource projects could provide leadership in the dissemination of STEM instructional materials and practices and ways to integrate research experiences into the undergraduate curriculum. Resource projects could provide expertise about assessing student learning and findings on what we know about how students learn and what pedagogies work under what conditions. Resource Projects could provide for a series of meetings designed to increase cooperation and collaboration among large groups of PIs with similar interests. Examples of possible Central Resource projects are provided in the solicitation. It should be noted that Central Resource projects most likely would extend beyond a single discipline to impact CCLI grantees and other broad communities of NSF grantees.

CCLI welcomes proposals describing untested, forward-looking, and unconventional activities that could have high impact and contribute to transforming undergraduate STEM education. Most CCLI projects fall into one (or more) of the project components listed below, and the solicitation provides greater detail about each of these. Therefore, if you are considering a proposal to the CCLI program, plan to spend some time reviewing the relevant sections of the program guidelines, which include:

- Creating Learning Materials and Strategies
- Implementing New Instructional Strategies
- Developing Faculty Expertise
- Assessing and Evaluating Student Achievement
- Conducting Research on Undergraduate STEM Education

Many proposals submitted from geosciences PIs include the acquisition of instruments. Such proposals would fit best under the first two components ('Creating Learning Materials and Strategies' and 'Implementing

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New Instructional Strategies'). Geosciences reviewers generally are very supportive of proposals that aim to improve student learning by integrating data collection and analysis into classroom and research experiences. However, any such proposal should clearly center around the impact of the project activities on student learning and not simply focus on the instrument and its capabilities. In addition to the cost of the instrument, you may include in your budget any costs normally supported by NSF and justified in the proposal. Involving undergraduate students in the development of a project is a good idea and they often can provide an early reality check on the pedagogical methods or educational materials being developed. The inclusion of salary for graduate students is appropriate, but it's important that the budget justification clearly describes their role, or for that matter, the role of any additional personnel who you propose to involve in the project.

If you are preparing a proposal for submission to the CCLI program, you might want to begin the process by 1) identifying what you want to do, 2) exploring relevant disciplinary education literature, 3) considering how your project is informed by prior efforts and how your findings will contribute to advancing the knowledge base, and 4) placing the idea for the focus of your proposal within one of the main CCLI project components identified in the list above. If you are unsure about whether or not your idea fits within the CCLI program, contact a Program Officer in advance of proposal submission. Program Officers in DUE are happy to discuss your ideas with you over the phone or by email, so don't overlook this important step in the process and take advantage of their expertise. The Program Officer can help you determine if your idea fits the CCLI program, can provide ideas about how you can modify your ideas to better match the CCLI guidelines, or can recommend other NSF programs that might better suit your needs.

### **CCLI comes in different sizes**

One of the significant changes between the new solicitation and the one it replaces is that 'types' have replaced 'phases'. You might think this is a trivial change, but it's not. During the years of the CCLI solicitation with three 'phases', it became apparent to the DUE Program Officers that the STEM community often viewed the phases as distinct steps, with a Phase 1 project needed to progress to Phase 2 or Phase 3. In fact, many projects began and ended at Phase 1. Others submitted to the program already reflected results from previous work and thus were ready for Phase 2 or 3 without a prior Phase 1 grant. To eliminate this confusion and to provide greater flexibility in the program, the new solicitation allows proposals to be submitted as Type 1, Type 2, or Type 3 requests. These three types are independent and correspond to different levels of support and scale, scope, and stage of development. Type 1 projects typically are of smaller scale, scope and stage than Types 2 and 3 and have budgets up to \$200,000 (\$250,000 for projects involving collaborations between four-year colleges and universities and two-year colleges) for 2 to 3 years. Type 2 projects have budgets up to \$600,000 for 2 to 4 years and

Type 3 projects have budgets up to \$5 million over 5 years. Type 2 and 3 projects will typically reflect greater dependence on previous work. However, the choice of what type should be made based on the resources required to achieve the desired outcomes. The solicitation provides examples of Type 1, 2, and 3 projects as a guide to prospective PIs. If you are not sure what 'type' your idea fits under, it is a good idea to contact a Program Officer.

The CCLI program does not have letters of intent or preliminary proposals. The deadlines for full proposals are:

- *May 21, 2009* for Type 1 proposals from submitting organizations located in states or territories beginning with A through M
- *May 22, 2009* for Type 1 proposals from submitting organizations located in states or territories beginning with N through W
- *January 13, 2010* for Type 2 and 3 proposals and for CCLI Central Resource Project proposals. However, CCLI Central Resource Project proposals for small focused workshops may be submitted at any time after consulting with a program officer.

### **Suggestions for writing your CCLI proposal**

While you do not need to do all of the following, many of the suggestions below will help you prepare a stronger CCLI proposal.

- Read the program solicitation and determine how your ideas best match the solicitation.
- Articulate goals, objectives, and outcomes and explain how the proposed activities contribute to improving student learning.
- Build on the existing knowledge base; review the literature and demonstrate you are aware of what others have done and how your proposed effort is informed by previous work.
- Explore potential collaborations with industry, business, other academic department and institutions (this can increase the impact of the project).
- Use data to document existing shortcomings in student learning.
- Describe your management plan (identify tasks, timeline, and roles and responsibilities for each member of your project team).
- Integrate project evaluation into your proposed project; identify an independent and experienced project evaluator; work with your evaluator to clarify the nature of your project, purpose of the evaluation, and what questions guide the evaluation; and seek their advice on the best instruments and methods to assess the outcomes you identified for your project. Most projects benefit from a formative and a summative evaluation.
- Identify strategies for dissemination (and consider ways to actively disseminate your project including workshops in association with professional conferences).
- Provide letters of support, collaboration, etc. as evidence of prior planning.

### **Some final comments**

What you may not know about the CCLI program is how program resources are distributed. In DUE, all of the disciplines comprising the research directorates are represented. While not a perfect correlation (you can't really have a partial Program Officer!), the number of

Program Officers is largely tied to the number of proposals submitted within a particular discipline. For example, there are four chemistry program officers, four engineering program officers, four biology, three mathematics, three interdisciplinary, two computer sciences, two physics/astronomy, two social sciences, and ONE geosciences program officer. This indicates that our community simply does not submit the number of proposals it could, or should, to DUE programs in general and to the CCLI program in particular. The overall distribution of CCLI program funds is based on the number of proposals submitted to each discipline, and those submitted to geosciences usually accounts for about 5% of the total received in any given round of the CCLI program. On the other hand, geosciences does have one of the largest, longest running faculty development CCLI projects in the well-known "Cutting Edge" workshops, and the community is generally quite active in attempting curricular innovation. Consequently, it's surprising to see such a small number of submissions from such an active group of faculty.

Consider submitting proposals that take advantage of new research findings, technological opportunities made possible via the Internet, visualization software, or developing instruments and tools for acquiring and analyzing various types of geoscientific data (one recent example is Lidar), and can advance our understanding of how to teach key geoscience concepts. Topics of special interest include climate change, sustainability, and energy. I encourage members of the geosciences community to apply to the CCLI program and to take advantage of all the ways this program can provide support for implementing your ideas to improve undergraduate geoscience education.

## REFERENCES

McBride, Duncan and Singer, Jill, 2002, "The Course, Curriculum, and Laboratory Improvement (CCLI) Program: Program Overview, Changes for 2002, and Suggestions for Faculty", *CUR Quarterly*, XXII(3), 110-114.